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INTERNATIONAL PRELIMINARY EXAMINATION REPORT
(PCT Article 36 and Rule 70)

10 JUN 2005

Applicant's or agent's file reference P81130PC00/ACC	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No. PCT/EP 03/14261	International filing date *(day/month/year)* 15.12.2003	Priority date *(day/month/year)* 17.12.2002

International Patent Classification (IPC) or both national classification and IPC
H04L27/36

Applicant
TELEFONAKTIEBOLAGET L M ERICSSON (PUBL) et al.

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 8 sheets, including this cover sheet.

   ☐ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of   sheets.

3. This report contains indications relating to the following items:

   I ☒ Basis of the opinion

   II ☐ Priority

   III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

   IV ☐ Lack of unity of invention

   V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

   VI ☐ Certain documents cited

   VII ☐ Certain defects in the international application

   VIII ☐ Certain observations on the international application

Date of submission of the demand 01.07.2004	Date of completion of this report 23.12.2004
Name and mailing address of the International preliminary examining authority: European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized Officer Baltersee, J Telephone No. +49 89 2399-7126

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.   PCT/EP 03/14261

I. Basis of the report

1. With regard to the **elements** of the international application *(Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)):*

Description, Pages

1-9   as originally filed

Claims, Numbers

1-7   as originally filed

Drawings, Sheets

1/4-4/4   as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

☐   the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).

☐   the language of publication of the international application (under Rule 48.3(b)).

☐   the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

☐   contained in the international application in written form.

☐   filed together with the international application in computer readable form.

☐   furnished subsequently to this Authority in written form.

☐   furnished subsequently to this Authority in computer readable form.

☐   The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐   The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

☐   the description,   pages:

☐   the claims,   Nos.:

☐   the drawings,   sheets:

5. ☐   This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-7
	No:	Claims	
Inventive step (IS)	Yes:	Claims	
	No:	Claims	1-7
Industrial applicability (IA)	Yes:	Claims	1-7
	No:	Claims	

2. Citations and explanations

see separate sheet

Re Item V
Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1.   Reference is made to the following documents:

    D1:   US-A-5 111 155 (KEATE CHRISTOPHER R ET AL) 5 May 1992 (1992-05-05)

    D2:   US-B1-6 222 405 (BOCKELMAN DAVID E ET AL) 24 April 2001 (2001-04-24)

    D3:   US-B1-6 240 142 (APARIN VLADIMIR ET AL) 29 May 2001 (2001-05-29)

    D4:   US-A-5 438 301 (MONTGOMERY ROBERT K ET AL) 1 August 1995 (1995-08-01)

The requirements of Article 6 PCT

2.1   Claims 1, 2 and 4 are not supported by the description as required by Article 6 PCT, as their scope is broader than justified by the description and drawings. The reasons therefor are the following:

According to claims 1, 2 and 4, the input I signal and the input Q signal are scaled with a first and a second scaling factor dependent on the phase error of the quadrature outputs of a local oscillator utilised during quadrature modulation, the first factor comprising $2\cos(\alpha/2)$, wherein α is the relative phase of the quadrature output of the local oscillator utilised during quadrature modulation of the added and subtracted signals. The description, however, clearly conveys the impression that the first and second scaling factors are given by the exact expressions $1/(2\cos(\alpha/2))$ and $1/(2\sin(\alpha/2))$, respectively (See page 7, lines 8-16 of the description). No other possibilities for the scaling factors are envisaged or detailed anywhere.

It is thus concluded that the current formulation of claims 1, 2, and 4 is clearly going beyond the invention. Therefore, said claims do not meet the requirements of Article 6 PCT.

2.2   Although claims 1 and 2 have been drafted as separate independent claims, they

appear to relate effectively to the same subject-matter and to differ from each other only with regard to the definition of the subject-matter for which protection is sought and in respect of the terminology used for the features of that subject-matter. The aforementioned claims therefore lack conciseness. Moreover, lack of clarity of the claims as a whole arises, since the plurality of independent claims makes it difficult, if not impossible, to determine the matter for which protection is sought, and places an undue burden on others seeking to establish the extent of the protection. Hence, claims 1 and 2 do not meet the requirements of Article 6 PCT.

2.3   According to claims 1, 2, and 4 a first scaling factor comprises $2\cos(\alpha/2)$, wherein α is the relative phase of the quadrature output of the local oscillator utilised during quadrature modulation of the added and subtracted signals. However, added and subtracted signals are only defined later in the claims, and therefore it is unclear what is meant with added and subtracted signals.

Therefore, claims 1, 2, and 4 do not meet the requirements of Article 6 PCT.

The requirements of novelty and inventive step

3.1   The document D1 is regarded as being the closest prior art to the subject-matter of claim 4, and discloses,

A quadrature modulator for modulating I and Q signals (see D1, column 2, lines 62-67 and Figure 6A) comprising:
a first scaling means for scaling the input I signal by a first scaling factor (see D1, column 2, lines 43-61 and Figure 5);
a second scaling means for scaling the input Q signal by a second scaling factor (see D1, column 2, lines 43-61 and Figure 5);
adding means for adding the scaled I and Q signals (see D1, column 2, lines 43-61 and Figure 5);
subtracting means for subtracting the scaled I and Q signals (see D1, column 2, lines 43-61 and Figure 5); and
modulating means for quadrature modulating the added and subtracted signals (see D1, column 2, lines 62-67 and Figure 6A), wherein one of the scaling factors is dependent on the phase error (see D1, column 6, lines 27-29).

3.2   The subject matter of claim 4 differs from the teaching in D1 in that the source of

the phase error is the local oscillator utilised during quadrature modulation of the added and subtracted signals, and that both scaling factors are dependent on the phase error (It is pointed out that due to the objections raised under Points 2.1 and 2.3 of this written opinion, the further limitation imposed by the feature of a first scaling factor comprising $2\cos(\alpha/2)$ cannot be taken into account in the analysis of an inventive step).

3.3   The problem to be solved by the present invention may therefore be regarded as adapting the quadrature modulator disclosed in D1 to compensate for a phase error of a different source, and to provide scaling factors to compensate for the magnitude changes of the resulting quadrature components.

3.4   The solution proposed in claim 4 of the present application cannot be considered as involving an inventive step (Articles 33(3) PCT) for the following reasons:

3.5   1) Document D1 discloses a quadrature modulator comprising compensation means for compensating the phase error of the RF amplifier (see column 2, lines 36-42). However, it would be obvious to the person skilled in the art that the quadrature modulator disclosed in document D1 is also capable of compensating for phase errors due to the local quadrature oscillator. For one thing, it is indicated in D1, in column 2, lines 36-42, that the source of the phase error is not limited to the RF amplifier. Secondly, compensation means for phase errors of the local quadrature oscillator that work according to the same principle as the one disclosed in the application are known in the art, see for example document D2, page 3, lines 4-11, or document D3, column 4, line 60 up to column 5, line 5 and Figure 2. The skilled persion would therefore regard it as a normal option to employ the quadrature modulator disclosed in D1 in order to solve the problem posed.

3.6   2) Document D2 describes the same problem of unequal magnitude of the sum and difference signals and proposes as a solution to equalize the magnitudes (see D2, page 2, lines 27-28 and page 3, lines 4-11). In order to equalize the magnitudes, the person skilled in the art would resort to standard textbook trigonometry and calculate the magnitude changes, and thus he would necessarily arrive at scaling factors which are dependent on the phase error (Via the trigonometric identities, the person skilled in the art would, in fact, calculate magnitude changes of $2\cos(\alpha/2)$ and $2\sin(\alpha/2)$, identical to the factors described on page 7, lines 8-16 of the description).

3.7   The combination of features in claim 4 is regarded as a mere juxtaposition of known technical features functioning in their normal way and not producing any non-obvious working inter-relationship (see PCT Guidelines - Gazette, Section IV, IV 8.3a). Consequently, the person skilled in the art would readily employ the quadrature modulator disclosed in D1 to compensate for an oscillator phase error and scale I and Q signals with phase dependent factors in order to solve the problem posed.

3.8   Therefore, claim 4 appears not to meet the requirements of Article 33(1) PCT for lack of inventive step (Article 33(3) PCT) of its subject-matter.

4.   Claims 1, 2 contain the same technical features as claim 4, but in terms of method claims, and therefore the same argumentation used under Points 3.1-3.7 holds.

Thus, the subject matter of independent claims 1, 2 does not involve an inventive step over the disclosure of document D1 combined with that of document D2, Article 33(3) PCT.

5.   The supplementary features introduced by dependent claims 3, 5, 6, 7 relate to minor implementation details that do not add anything of inventive significance to the subject matters of independent claims 1, 2, 4 because these features are either known from the above prior art D1-D4, for example,

-       claim 6: see document D1, Figure 6A or document D3, column 6, lines 23-28 and Figure 2
-       claim 7: see document D3, column 8, lines 40-43

or a common design measures, for example,

-       claims 3, 5: scaling factors comprising $2.\sin(alpha/2)$, see also Section 3.6 of this communication

Therefore these dependent claims do not meet the requirements of Articles 33(1) and 33(3) PCT.

Concluding remarks

6.   Independent claims 1, 2, and 4 are not in the two-part form in accordance with

Rule 6.3(b) PCT, which in the present case would be appropriate, with those features known in combination from the prior art (document D1) being placed in the preamble (Rule 6.3(b)(i) PCT) and with the remaining features being included in the characterising part (Rule 6.3(b)(ii) PCT).